AGRICULTURAL NEWS LETTER

VOL. 3 - NO. 5 MAY 1935

THIS PUBLICATION GIVES INFORMATION on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.

This issue contains:

Issued by
Publicity Bureau
E. I. du Pont de Nemours & Co.
Wilmington, Del.

NEW CONTACT INSECTICIDES FROM FATTY ALCOHOLS; THEIR DEVELOPMENT AND TESTS OF THEIR TOXICITY

EDITOR'S NOTE:- This contribution is a summary of a paper presented before the Division of Agricultural and Food Chemistry, New York Meeting of the American Chemical Society, April 22-26, 1935. It is printed here by permission.

By E. W. Bousquet, H. F. Dietz
and P. L. Salzberg*

In a recent paper we discussed the importance of physical properties of contact insecticides with relation to their wetting, spreading, and penetrating characteristics. Now these properties are generally associated with long chain aliphatic compounds as exemplified by the soaps of fatty acids. The introduction of a toxic group in the compounds of this type has how provided a new line of attack on the problem of synthesizing contact insecticides and has resulted in the development of long chain rhodanates which in the form of Loro** are finding increasing importance in the control of sucking insects.

The production of these rhodanates has been made possible through the recent commercial hydrogenation of natural glycerides to the corresponding alcohols. These alcohols are then converted to the rhodanates through the intermediate chlorides. Thus by starting with coconut oil, it is possible to obtain a series of rhodanates varying in molecular weight from hexyl rhodanate which is a mobile liquid to stearyl rhodanate which is a waxy solid. A very striking relationship between molecular weight and toxicity has been developed through a study of the contact action of the series of rhodanates when used in the form of emulsions with soap spreaders. These tests have been carried out against black chrysanthemum aphids, green chrysanthemum aphids, nasturtium aphids, green peach aphids, thrips, and red spider. In general, the very low alkyl rhodanates such as methyl, ethyl, and butyl rhodanates show very little efficiency against aphids when used at a dilution of approximately 1:1000, but a marked increase begins to appear with the six carbon hexyl rhodanate which reaches a maximum with the twelve carbon lauryl rhodanate and then decreases until the eighteen carbon stearyl rhodanate again shows relatively little action. Particular emphasis has therefore been placed on exploring in some detail the relative efficiencies of the hexyl to cetyl compounds and concentration control curves for all of the even carbon rhodanates in this range have been determined. From these curves it is possible to determine the dilution necessary for obtaining a 50% kill which is considered the most reliable measure of relative efficiency. The figures so

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obtained in the case of green chrysanthemum aphids are given in the following table:

TABLE I

Dilutions of Alkyl Rhodanates Required to give a 50% Kill of Green Chrysanthemum Aphids

Hexyl Rhodanate	1:1200
Octyl Rhodanate	1:2500
Decyl Rhodanate	1:2850
Lauryl Rhodanate	1:2950
Myristyl Rhodanate	1:2700
Cetyl Rhodanate	1:1700

In the above tests pure potassium oleate was used as the spreader at the same concentration as the rhodanate.

Lauryl rhodanate, the most effective member of this series, has been found to be very appreciably more effective than nicotine on some of the more resistant species of sucking insects. The following table records the results of numerous tests on a wide variety of insects carried out in the greenhouse during the past year:

TABLE II

Comparison of Lauryl Rhodanate with Nicotine

Insect	Concentration	Spreader	Nicotine	Rhodanate
Black chrysanthemum aphids	1:2000	Soap	96	97
Black chrysanthemum aphids	1:4000	Soap	94	97
Black chrysanthemum aphids	1:4000	Sulf.*	95	95
Green chrysanthemum aphids	1:1000	Soap	72	98
Black nasturtium aphids	1:4000	Sulf.*	83	97
" " "	1:4000	Sulf.*	82	98
Green Peach Aphids	1:600	Soap	96	98
Currant Aphids	1:1000	Sulf.*	100	97

*Sulfonated oil

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The technical product combined with active emulsifying agents in the form of Loro is proving in field tests to be especially valuable in the control of such resistant insects as mealy bugs, red spider, certain kinds of scale, and thrips.

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**"Loro" is the trade name registered by the Grasselli Chemical Company, Cleveland, Ohio, to cover this product.

SEED TREATMENT AS AN AID TO BETTER CORN YIELDS THIS YEAR IS ADVOCATED

EDITOR'S NOTE:- There is presented here another timely and highly informative discussion of seed treatment by Dr. Haskell. In the April issue Dr. Haskell discussed measures taken to offset a threatened shortage of grain seed. Acknowledgment of permission to use the article below is made to Dr. C. W. Warburton, Director of Extension Work, U. S. Department of Agriculture.

By R. J. Haskell,
Extension Plant Pathologist, Extension Service,
United States Department of Agriculture.

With a shortage of good seed corn in many States this year, farmers may be forced to use seed that is not up to the usual standards. Some of the seed that will be planted ordinarily would not be used. Some of it may be old seed left over from 1933 or even 1932. Some of it may be corn that has been exposed to the weather. It may have moldy tips or the butts may be discolored or shredded indicating a diseased condition of the ears. Ears bearing kernels injured from rough handling or by rodents may be included. Ears of corn that are now being sent into some of the agricultural colleges and seed testing laboratories indicate low germination of some lots particularly the old ones. Some of the old seed germinates as low as 50 per cent with from 25 to 50 per cent of it diseased. At the Indiana Experiment Station this winter where germination tests have been made of 5000 ears from 75 counties the germination has been very good averaging 97.8. However, about 4 per cent of this corn showed infection with the disease caused by the fungus Diplodia and about 44 per cent of the kernels showed the presence of various molds in the germinator, such as bread mold, and the blue and pink molds.

Seed Treatment Introduced

During the past few years there has come into use in several of the States a group of seed disinfectants for corn which help prevent some of these molds and thus reduce the amount of seed decay, give better stands and better yields. These seed disinfectants will not bring dead kernels back to life but they will sometimes save kernels from decay, especially when wet, cold weather prevails immediately after planting. It has been found that treated seed can be planted earlier than untreated seed and thus give a better stand and longer growing period.

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Increased Yields

The States where seed treatment has been found to be useful include Iowa, Minnesota, Illinois and Indiana. Other neighboring States are also finding some benefits but experimental data are not generally available at this time to show the exact area where seed treatment is profitable. West of the Missouri river in States like Kansas and Nebraska, the benefits do not seem to be apparent according to experimental tests there. However, in Iowa during the seven-year period from 1927 to 1932, inclusive, the result of a large number of tests with farm-run seed showed an average increase in yield of 3.8 bushels per acre by treating seed. In Illinois the average yield from farmers, seed has been increased about 3 bushels by use of the better dust disinfectants and in Indiana similar increases have been obtained. The benefit is most pronounced on seed that is diseased, particularly with the fungus Diplodia. Seed treatment gives larger increases with poor seed, therefore, than it does with high-quality seed that is practically free from disease.

Methods of Treating

The organic mercury dusts available for treating corn seed usually are applied at the rate of 2 oz. per bushel. To insure thorough mixing of the dust and seed various devices can be used. A barrel churn is one of the most convenient mixing machines. The churn should be half filled with corn, the right amount of dust added to it and the churn revolved slowly for about three minutes. Other similar mixers such as are used for treating small grain seed are sometimes used and many farmers use an old milk can for this operation. When a milk can is used it is well to rock it from end to end occasionally as well as to roll it on its side. The object is to get a good coating of the dust on the seed. It is not sufficient to mix the dust by shoveling with the grain.

The cost of treating is very slight. The dusts sell for approximately $1.50 a pound and one pound will treat 8 bushels of seed. This is usually enough to plant 50 acres so that the cost per acre comes to about 3 cents. If only one bushel increase in yield per acre is secured the treatment will pay for itself many times.

These commercial dusts of which there are three on the market at the present time may be obtained from local druggists, seedsmen, hardware dealers and farm supply stores. Ask for one of the organic mercury dusts especially prepared for treating seed corn.

Germination Tests Important

Along with the seed treatment should go germination tests to determine the viability and vigor of the seed. This will help growers pick out their highest germinating seed ears and those that

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are freest from mold and disease. Badly molded ears should be discarded. Ears having only a small amount of mold on the tips or butts should have the kernels removed and discarded from those parts of the ear. Kernels showing mouse injury or damage from rough handling should be shelled off and discarded. The remainder of the shelled seed corn should be treated as just described, especially if you live in the States of the Central West.

Seed treatment is not a substitute for good seed nor for the germination test but it is an aid in securing a better stand of stronger plants from seed that is not of first quality.

It may increase yields from 2 to 4 bushels depending on the year. It permits earlier planting. It is good insurance and should have a very useful place in the 1935 corn seed program.

DAMPING-OFF OF SEEDLINGS CONTROLLED BY NEW METHOD OF USING FORMALDEHYDE

EDITOR'S NOTE:- The important findings of Dr. Haenseler, given below, were reported in New Jersey Agriculture, Vol. XVII, No. 1, published by the Agricultural Experiment Station and the College of Agriculture, Rutgers University, New Brunswick, New Jersey.

By C. M. Haenseler, Associate Plant Pathologist

A new method of using formaldehyde as a control for damping-off of seedlings has been developed by the Department of Plant Pathology of the Experiment Station and has been used with excellent results on certain types of seeds during the past six years. The treatment was developed primarily to prevent the heavy loss of beet seedlings which occurred almost annually in a series of commercial greenhouses despite efforts to control the trouble by means of seed treatment and steam sterilization of the soil.

Great Increase in Stand

Preliminary tests conducted in 1929 showed that damping-off of beets could be almost completely eliminated by soaking the beds with a weak solution of formaldehyde immediately after seeding. Over 400% increase in stand compared with untreated plots was obtained in some of these tests and marked improvements were shown in all cases where the proper dilutions were used. As a result of numerous trials it was found that the most satisfactory results with beets were obtained by sprinkling the bed immediately or within a few hours after seeding with a solution of one part commercial formalin (38-40% formaldehyde) in 200 parts of water used at the rate of 1½ pints to the square foot of bed surface.

During the past five years this treatment has been used as a standard damping-off control measure in a series of commercial greenhouses on approximately 50,000 to 70,000 square feet of bed annually and has given excellent results in every case.

Tried on Other Seeds

This same method, with the formaldehyde concentration somewhat reduced, has been used on a smaller scale on a number of other vegetable seeds during the past five years. One part of formalin in 300 parts of water has given good control of damping-off of cucumber, melon, peas, tomato, eggplant and pepper, and a

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1-400 dilution improved the stand of some of the more sensitive seed types. Radish, cabbage and cauliflower, on the other hand, were found to be extremely sensitive to formaldehyde and were seriously injured by concentrations which gave perfect results with other crops.

The method seems to deserve a place in our damping-off control program but for the present it should not be used at all for crucifers and should be used with caution on all crops until the proper concentration and dosage is determined for the various kinds of seeds and each soil type.

CLEANING OUT DRAINAGE DITCHES AND FARM PONDS OR WATER HOLES

EDITOR'S NOTE:- This article discusses the need for cleaning out ditches to restore their capacity and points out a number of important things to consider in connection with the work. Reference is also made to the methods to be followed in cleaning out ponds and water holes.

By L. F. Livingston, Manager,
Agricultural Extension Section,
E. I. du Pont de Nemours & Co.

According to drainage authorities most ditches need cleaning out every five to seven years after being dug. How often the work should be done depends on the type of soil and the fall in the ditches. The filling in of a ditch starts with the forming of bars caused by plant roots, stumps, roots, trees, or by the inflow from a lateral ditch.

Of course, the thing to do is to remove immediately any obstructions found in a ditch and to blast out bars as soon as they begin to form. Periodical inspection of a drainage system is an important factor in maintenance. It is especially important to inspect ditches after a period of heavy rains. In a number of instances, those in charge of drainage districts have supplies of dynamite constantly on hand and thereby are in position to proceed with clean-out work without delay.

It is sometimes the case that through neglect ditches become completely filled. That, however, is met with more frequently in private drainage on individual farms than where the ditches are part of a drainage district system. Quite naturally, where a ditch has been obliterated by filling, it must be loaded and shot in the same manner as a new ditch.

Where the banks of a partially filled ditch are less than 3 feet high, they need not be taken into consideration in loading. But for banks higher than 3 feet, more dynamite is required to throw the mud and debris clear of the ditch. The additional amount of dynamite necessary depends on the height of the banks and should be determined by a test shot.

For ditch clean-out work, the blaster may follow any of the more or less standardized practices of ditch blasting. The method adopted, the amount of dynamite to use and other factors will be determined by the width and depth desired. It is, however,

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very important that the greatest care be exercised not to disturb the original sidewalls of a ditch, for if the side slope is altered, the next high water will wash the loosened material into the bottom of the ditch.

It is usually difficult to clean out a ditch that is not at least twice as wide at the top as it is deep, unless the top is widened also.

Cleaning Out Ponds or Water Holes

Ponds or water holes may be cleaned out by cross-section or post-hole blasting; the same methods used for making such excavations. Both of these methods have been described in articles of this series.

THE INTERDEPENDENCE OF AGRICULTURE AND THE AMERICAN CHEMICAL INDUSTRY

EDITOR'S NOTE:- Recognition is now being given to the fact that agricultural research can be of very considerable value to the chemical industry through the development of efficient and economical methods of producing farm products for use as raw materials for chemical manufactures. Possibilities along this line are inferred by excerpts, presented here, from an address before a large and important group representing the chemical industry.

The interdependence of the American Chemical Industry and agriculture was definitely established in various ways during the Tercentenary Celebration of the Foundation of the American Chemical Industry, held in New York City, April 22-26, under the auspices of the American Chemical Society.

Stress was laid on the significant fact that while the farmer must depend upon chemistry in almost countless ways, chemical manufacture must more and more look to the farm as the source of essential raw materials. It was in fact evident from the discussions that, eventually, "the factory stomach will consume more agricultural products than does the human stomach," as one scientist puts it.

Lammot du Pont, president, E. I. du Pont de Nemours & Company, speaking on the subject, "Human Wants and The Chemical Industry," stated that at the time of the World War all nitrogen for industrial and agricultural purposes was obtained from two sources, namely, from the distillation of coal and from Chile saltpeter. "It has been pointed out by others," Mr. du Pont said, "that while the supply of coal is plentiful, the recoverable nitrogen by distillation is only one-quarter of one per cent, so that it is necessary to distil 400 tons of coal in order to get one ton of nitrogen. Likewise, Chilean nitrate is plentiful but the supply is controlled by the Chilean Government, and in time of war the risk to ocean shipments is great.

"After the War," he continued, "the chemical industry turned its attention to the manufacture of ammonia and its oxidation to nitric acid, realizing that these important raw materials were indispensable to our national development and too important to rely upon foreign sources of supply. Thirteen years ago began the development of the nitrogen industry and such remarkable progress has been made that, today, industry and agriculture are no

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longer dependent upon by-product ammonia from the distillation of coal or upon Chile saltpeter for their products containing nitrogen.

"In considering the relationship of the chemical industry to agriculture, it is evident this country now has its domestic nitrogen, potash, and phosphate industries. Relatively little attention, however, has been given to the possible need of the soil for other elements, such as sulfur, magnesium, calcium and manganese, which are beginning to be appreciated as having important relation to crops. Instead of making standard types of fertilizers, more attention will undoubtedly be given to the specific suitability of the fertilizer to the particular soil and to the particular crop for which it is used. The question of soil acidity is one which has been neglected by the farmer and the type of fertilizer has an effect upon this important variable. The chemical manufacturer is beginning to pay more attention to this problem in the type of nitrogen compounds offered, as evidence by the use of urea in fertilizers."

Further, this speaker said: "In controlling pests which have caused an annual damage of hundreds of millions of dollars, chief dependence has been placed in the past on compounds of lead and arsenic which are, unfortunately, toxic to human beings as well as to insects. Although these products have been used for a very long time and have given good control, attention has been directed in recent years by the chemical manufacturer to the possibilities of organic compounds which may be more effective on a weight basis and at the same time less toxic to human beings. As our knowledge of the toxicity of organic compounds to insect life progresses, it is not unreasonable to assume that from the enormous number of organic materials that are known today, it should be possible to select materials that have a high specificity for different types of insects."

With reference to the dependence of the chemist on the farmer, Mr. du Pont remarked: "As the chemical industry has been an aid to the farmer in increasing production, so also the products of agriculture have been important as raw materials for the chemical industry. Cotton is used as the initial material for rayon, acetate rayon, lacquers, photographic films and plastics; vegetable oils are used in the manufacture of paints, varnishes and enamels; turpentine is being converted into synthetic camphor--replacing the natural and imported product; a large variety of uses have been developed for turpentine and rosin; corn is used for making butyl alcohols and acetone.* Other examples could be cited of uses that the chemical industry has been making of the products of the farm, but those mentioned are sufficient to show the use of farm products in the chemical industry."

*The du Pont Company and its subsidiaries use the farm products mentioned, along with various others in their chemical manufactures.

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